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FINAL TECHNICAL REPORT

NASA Grant NAG 5-1171

*Ultraviolet Observations of NGC 4395, the Least Luminous
and Nearest Known Seyfert 1 Nucleus*

Alexei V. Filippenko, Principal Investigator

University of California at Berkeley

The purpose of the grant was to obtain and analyse *IUE* spectra of the spiral galaxy NGC 4395, which contains the nearest and least luminous known Seyfert nucleus. The ultraviolet (UV) spectra were to be used to test the intriguing hypothesis that the "activity" could be explained by purely stellar phenomena, and to further explore the unprecedented properties of this nucleus. To test the feasibility of the project (the nucleus of NGC 4395 is very faint), one *IUE* shift was allocated, with the possibility of three additional shifts later on. Ultraviolet observations were attempted with *IUE* on 4 June 1989. Unfortunately, it was found that the only available guide star could no longer be detected sufficiently well with the FES, whose present sensitivity is lower than it was at the beginning of the *IUE* mission. Thus, it is no longer possible to observe NGC 4395 with *IUE*. Given these circumstances, as well as the faintness of the nucleus of NGC 4395, a Cycle 2 *HST* proposal for observations of this object has been submitted.

Since NGC 4395 could not be observed, the allocated shift was spent on H1821+643, the second brightest QSO in the sky. The observations were made as part of an approved *IUE* program ("New X-Ray Bright Quasars") whose PI was Dr. Jules P. Halpern

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(Columbia University). A. V. Filippenko was allowed to obtain these observations because he was a collaborator on this proposal. The observations were successful; two excellent exposures were taken (SWP 36396, LWP 15659). They were published in the 1991 May 20 issue of *The Astrophysical Journal* (1991, **373**, 57–65); a copy of the article is attached to this report. We found a strong optical/UV “big bump” which continues past the Lyman limit in the rest frame of the QSO. A possible turnover at the high-frequency side of the UV continuum constrained fits of a thin accretion disk model to a large black hole mass and a high accretion rate, but a small disk size. The shape of the UV continuum was found to be variable, with a hardening of the spectrum when the source was brighter.

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Kolman, M., Halpern, J. P., Shrader, C. R., and Filippenko, A. V. 1991, *Astrophysical Journal*, **373**, 57–65. “The Ultraviolet Spectrum and Continuum Energy Distribution of the Bright QSO H1821+643.”